Global Directionality and Behavioral Flexibility

Does evolution have a global tendency towards higher complexity? A priori, it seems that such a tendency could not be mediated by natural selection. Evolution by natural selection produces organisms that are adaptive to particular environments only, and thus describes a locally but not globally directional process. In this view evolution by natural selection is not progressive but merely successive.

Can we find such a tendency outside of natural selection? McShea and Brandon (2010) have argued for a 'Zero Force Evolutionary Law', which states that complexity spontaneously increases because identical entities spontaneously differentiate, in a process similar to that of diffusion. However, several difficulties prevent any clear judgment on the question of a global tendency to higher complexity. One of them is the fact that modes of minimal complexity (*e.g.* bacteria) remain occupied, so if there is a drive, it cannot be a 'strong' drive where all lineages of the biosphere universally tend towards higher complexity.

In this paper I suggest a way in which evolution may have a *global* tendency towards certain functions, without that tendency being *universal*. I will do so by exploring behavioral flexibility as a candidate for such a function. By means of a signal-detection model (Godfrey-Smith 1998), one can show one important condition for selection of behavioral flexibility is *variability* in the external environment. Because an organism's environment is not only defined by interactions with physical environment but also with other organisms, and because change in organismic structure is to be expected due to mutation and drift, variability in environment is to be expected as well. This suggests an expected bias towards flexibility, undermining a merely 'successive' view of evolution by natural selection.

In this way, the selection for flexibility could also be a driver for increasing phenotypic complexity, as the function of behavioral flexibility would presuppose a certain complexity in parts. It would also predict that minimal modes of complexity in general remain occupied, because in general flexible and inflexible strategies would have access to different pools of resources (flexibility opens up new pools of resources), thus avoiding direct competition. The tendency towards flexibility is not universal, and in this way some of the difficulties concerning ZFEL are avoided.

Length without references: 352 words

References

McShea D and Brandon R, 2010. *Biology's First Law.* University of Chicago Press.
Godfrey-Smith P, 1998. *Complexity and the function of Mind in Nature.* Cambridge University Press.